

PATENT APPLICATION

VARIABLE SPEED TRANSMISSION FOR SCOOTER

Inventor: Steven J. Patmont, a citizen of The United States, residing at
1889 Gray Court Gardnerville, NV 89410

Assignee: Patmont Motor Werks
P.O. Box 97
Pleasanton, CA, 94566

Entity: Small

VARIABLE SPEED TRANSMISSION FOR SCOOTER

CROSS-REFERENCES TO RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. Provisional Patent Application
5 No. 60/413,319, filed September 24, 2002, incorporated herein by reference.

STATEMENT AS TO RIGHTS TO INVENTIONS MADE UNDER FEDERALLY SPONSORED RESEARCH AND DEVELOPMENT

[0002] NOT APPLICABLE

10 REFERENCE TO A "SEQUENCE LISTING," A TABLE, OR A COMPUTER
PROGRAM LISTING APPENDIX SUBMITTED ON A COMPACT DISK.

[0003] NOT APPLICABLE

[0004] This invention relates to small, motor-driven vehicles, such as scooters and go-carts.
More particularly, a driven shaft from the vehicle motor for driving a driven wheel has an
15 adjustable diameter. When the driven shaft is adjusted to have a small diameter, the small,
motor-driven vehicle is propelled at low speed and high torque. When the driven shaft is
adjusted to have a larger diameter, the small, motor-driven vehicle is propelled at higher
speed and lower torque. Accordingly, the adjustable diameter of the driven shaft permits
optimization of vehicle torque and speed.

20 BACKGROUND OF THE INVENTION

[0005] Go-carts and scooters powered by motors are known. By way of example, see
Patmont, United States Patent 6,095,274, entitled Engine Drive for Scooter, in which the rider
of a scooter stands upon a scooter platform and directs a foreword steered wheel while
applying motor power through a throttle mechanism to a rear driven wheel. In this
25 disclosure, the throttle mechanism includes an engine mounted on a pivot arm offset from the
axis of rotation of the rear driven wheel of the scooter. This engine has a protruding driven
shaft overlying the driven wheel for moving into and out of contact with the periphery of the
driven wheel. Through offset mounting of the engine pivot relative to the point of rear wheel
rotation and the periphery of the driven wheel, the driving shaft can be brought into and out
30 of contact with the rear driven wheel for controlled propulsion of the scooter.

[0006] In this particular driving arrangement, the torque and speed applied to the rear driven wheel is a function of two parameters. First, the driven shaft must be in contact with the periphery of the driven wheel. Second, the torque and speed of the motor is transmitted through the driven shaft and directly transferred to the driven wheel. As the torque and speed of the engine varies, the torque and speed of the driven vehicle wheel varies.

[0007] Small, motor-driven vehicles, such as the scooter illustrated in the Patmont '274 patent, are used on surfaces having variable slopes and variable resistance to vehicle passage. It is common for such small, motor-driven vehicles to proceed uphill, on the level, and downhill. Further, it is common for such small, motor-driven vehicles to be used on an all-terrain basis on rough, sandy, or marshy ground where the resistance to the forward passage of the small, motor-driven vehicle is highly variable. Given a driven shaft of constant diameter, the only variation of torque and speed will be the variation of torque and speed of the driving motor. This is not necessarily in the best interest of efficient small, motor-driven vehicle propulsion.

[0008] Variable speed and torque transmissions are known. However, virtually none of these is suitable for the simple environment of a small, motor-driven vehicle, such as a scooter. Simply stated, between the motor and driven wheel, there is no room for mechanical complication. Simplicity is required in all these transmissions.

BRIEF SUMMARY OF THE INVENTION

[0009] A small, motor-driven vehicle has at least one steered wheel and at least one motor-driven wheel with the rider supported between the wheels. The rider directs the steered wheel while applying motor power through a throttle mechanism to the driven wheel. The throttle mechanism includes a driven shaft from the motor contacting the periphery of the driven wheel. This driven shaft has an adjustable diameter. When the driven shaft is adjusted to have a small diameter, the small, motor-driven vehicle is propelled at low speed and high torque with optimum power transmission for proceeding either uphill or over terrain presenting higher resistance to vehicle passage. When the driven shaft is adjusted to have a larger diameter, the small, motor-driven vehicle is propelled at higher speed and lower torque, on the level, downhill or over terrain presenting lower resistance to vehicle passage.

Accordingly, the adjustable diameter of the driven shaft permits optimization of scooter

torque and speed for proceeding with optimum motor efficiency.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] Fig. 1 is a side elevation view of a small, motor-driven vehicle, here shown as a scooter, illustrating the front steered wheel, the rear driven-wheel, and the rider supporting platform supported between the two wheels;

[0011] Fig. 2 is an enlarged side elevation similar to Fig. 1 illustrating the throttle mechanism of the Patmont '274 patent with the invention of this disclosure schematically shown in broken lines;

[0012] Fig. 3 is a first schematic of the drive mechanism shown in Fig. 2 illustrating the driven shaft with a small diameter for driving the driven wheel with high torque and low speed;

[0013] Fig. 4 is a second schematic of the drive mechanism shown in Fig. 2 illustrating the driven shaft with a larger diameter for driving the driven wheel with lower torque and higher speed;

[0014] Figs. 5A and 5B are first and second views of a mechanism having opposed interlocking parts for producing a variable diameter driven shaft with Fig. 5A illustrating the mechanism having a small diameter when fully expanded with one interlocking part away from the other interlocking part, and Fig. 5B illustrating the mechanism having a larger diameter when contracted with one interlocking part moved toward the other interlocking part; and,

[0015] Figs. 6A and 6B are first and second views of an inflatable variable diameter driven shaft with Fig. 6A illustrating the mechanism having a small diameter when deflated and Fig. 6B illustrating the mechanism having a larger diameter when inflated.

DETAILED DESCRIPTION OF THE INVENTION

[0016] Referring to Fig. 1, the small, motor-driven vehicle is shown as scooter S. Scooter S can be easily understood. Scooter S includes standing platform P, front steered wheel F and rear driven wheel R. Engine E drives rear driven wheel R in the apparatus disclosed herein.

[0017] Scooter S includes steering handle 14, which rotates on head tube H. The single structural member of the scooter chassis is main structural tube T. Main structural tube T connects to head tube H at the front, supports standing platform P in the middle via couplings 28 and 29 and terminates at rear tire mounting section 32. Referring specifically to FIG. 2, it

will be seen that main structural tube T has side-displacing section 30 followed by rear tire mounting section 32. Rear tire mounting section 32 supports rear driven-wheel R via axle 34.

[0018] Having generally set forth the construction of scooter S, attention will be given first to the physical mounting of engine E to main structural tube T and, second, to the mechanics of the driving of rear driven wheel R.

[0019] Referring to Fig. 2, engine E is mounted on pivot V. As can be seen in Fig. 4, engine E has a protruding driving shaft D, which here rotates at the same speed as engine E. Protruding driving shaft D directly contacts peripheral surface 40 of rear driven wheel R. It will be understood that when protruding driving shaft D is in contact with ground contact surface 40 and engine E is operating, scooter S will be driven.

[0020] Attention will now be devoted to the drive schematic of FIG. 3. Rear driven wheel R turns on axle 34. To understand the physics of this invention, note that radial 44 has been drawn from protruding driving shaft D and its contact point on the periphery 40 of rear driven wheel R.

[0021] Pivot V is offset with respect to this radial 44.

[0022] Specifically, pivot V should have an angle of 10° to 40° relative to the point of contact between protruding driving shaft D and peripheral surface 40. This range can be narrowed to be between 15° and 30° , and more optimally is 20° .

[0023] Further, the length of pivot arm 48 is preferably less than the length of radial 44 by a ratio of about 60% to 90% in a broad range, 70% to 80% in a medium range, and about 75% as shown in the preferred embodiment.

[0024] It will further be noticed that protruding driving shaft D swings in an arc 50. Arc 50 will be seen to intersect the periphery 40 of rear driven wheel R at an acute angle alpha.

[0025] Having set forth this construction, the interaction of protruding driving shaft D and rear driven wheel R during vehicle operation can now be set forth.

[0026] Specifically, and as illustrated in FIG. 3, rear driven wheel R turns counterclockwise. Protruding driving shaft D turns clockwise. Taking the reactive force from protruding driving shaft D, it will be understood that engine E on pivot arm 48 drives protruding shaft D counterclockwise and into contact with the periphery 40 of rear driven wheel R.

[0027] Given the position of pivot V, it will be understood that protruding driving shaft D moves along arc 50. This arc 50 contacts peripheral surface 40 of the driven wheel at a shallow (acute) angle. As a result of this motion, firm driving contact takes place—even in the absence of any other biasing forces present.

[0028] In the preferred embodiment, two biasing forces are present. One is the weight of engine E. The remaining force is supplied by tension from coil spring 52, which extends from the distal end of main structural tube T to engine E.

[0029] Referring to FIGS. 1 and 3, it will be understood that the motion of engine E and protruding driving shaft D into rear driven wheel R at peripheral surface 40 must be controlled. Precise control of this motion gives corresponding precise control of the motion of scooter S. This being the case, a cable control lever, such as derailleur cable ratchet 54 acting on cable 56, limits such contact. By the simple expedient of tensioning cable 56 through cable control lever 54, precision control of the scooter driving force occurs.

[0030] It should be understood that the drive here disclosed does not appreciably affect the placement of fender 58, which hinges to the chassis. Likewise, a conventional scooter brake 58 can be utilized.

[0031] It will be understood that where scooter S is used off road, it is possible to completely disengage engine E from rear driven wheel R. In this case, pushing or coasting of scooter S can occur in a conventional manner.

[0032] Thus far, the transmission of this invention has not been differentiated from that transmission set forth in the Patmont '274 patent, although it will be understood that the embodiments of Figs. 1, 2, 3, and 4 all incorporate this invention. Comparing driven shaft D' of Fig. 4 to driven shaft D of Fig. 3, the principle on which this invention operates can be readily understood.

[0033] The size of driven shaft D' is larger in diameter than driven shaft D of Fig. 3. Accordingly, rotation of driven shaft D' wheel drives the driven wheel R at a higher speed and lower torque from engine E. Understanding this much, what is needed is a mechanism for changing the diameter of rotating shaft D from its small diameter shown in Fig. 3 to the larger diameter shown in Fig. 4.

[0034] Before moving on to an explanation of these mechanisms, it is important to note with respect to Fig. 4, and the drive swinging axis there illustrated, that the larger diameter of driven shaft D' does not interfere with the operation of the transmission thus far described. The only consequence of the larger diameter driven shaft is that the engagement of the driven shaft with the periphery of driven wheel R occurs at a different angular interval of the engine E on the drive pivot position.

[0035] As of the writing of this Provisional Patent Application, the optimum mechanism for expanding and contracting the diameter of driven shaft D to driven shaft D' is being selected. At present, two mechanisms are shown for accomplishing this purpose. The

mechanism of Figs. 5A and 5B, illustrates opposed conical splines. The mechanism of Figs. 6A and 6B, illustrates an inflatable driven shaft. Using either alternative, the objectives sought by this disclosure can be realized.

[0036] Referring to Fig. 5A opposed conical spline sections 70A and 70B are illustrated.

5 Each spline section fastens to a cylindrical base 72 and has tapering, alternating, conical splines concentric about axis 74 of engine E rotation. In the view of Fig. 5A, spline sections 70A and 70B are remote one from another. In the view of Fig. 5B, spline sections 70A and 70B have been moved toward one another. Such movement is urged by wire 76 concentric to the rotating conical spline sections 70A and 70B. The reader will appreciate that if tension is
10 not exerted by wire 76 drawing the respective splines sections towards one another, the natural tendency of the spline sections will be to move away, one from the other.

[0037] Control of the mechanisms of Figs. 5A and 5B can be easily understood.

Specifically, derailleur cable ratchet (not shown) acting on wire 76 can produce, through the tension on the wire, the desired driven shaft diameter. At the same time, the respective
15 conical spline sections will provide the requisite traction to the driven wheel R.

[0038] Referring to Figs. 6A and 6B, an even simpler mechanism is illustrated. In this mechanism, driven shaft D is given an inflatable exterior 80. In Fig. 6A, inflatable exterior 80 is deflated through inflation conduit 82. As a result, driven shaft D has a small diameter and drives driven wheel R at low speed and high torque.

20 [0039] Referring to Fig. 6B, inflatable exterior 80 of driven shaft D' is inflated through inflation conduit 82. As a result, driven shaft D' has a large diameter and drives driven wheel R at high speed and lower torque.

[0040] The reader will understand that this Provisional Patent Application is intended to cover any mechanism which provides for the convenient expansion and contraction of the
25 driven shaft D, D'. It is anticipated that other preferred embodiments of this mechanism will be identified by the time a non-provisional patent application is filed.